AMSAT News Service Weekly Bulletins
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SB SAT @ AMSAT $ANS-071.01
W3IWI EXPLAINS SAT PROPAGATION

HR AMSAT NEWS SERVICE BULLETIN 071.01 FROM AMSAT HQ
SILVER SPRING, MD MARCH 12, 1994
TO ALL RADIO AMATEURS BT
BID: $ANS-071.01

W3IWI Explains A Propagation Phenomenon Observed By IT9XXS

Giovanni Mazzola (IT9XXS) posed a question about a propagation phenomenon he has been noticing on KO-23, KO-25, UO-22 and other digital satellites. He reported that he has regularly observed that at the end of the pass, when the satellite is between 0 and -2 degrees elevation, the signal exhibits three strong peaks. During the pass it may be S4 but when the three peaks in signal strength occur, they are over S9. After that he loses the signal altogether. He notes that he has a good horizon, looking out to the sea to the north.

Ton Clark (W3IWI) offers the following explanation: What IT9XXS is observing is classic and very predictable. It is the result of two physical effects: atmospheric refraction and "Lloyd's Mirror" reflections.

The earth's atmosphere bends the signals so that your "radio" horizon is below the physical horizon. The refractive index of the air is about 300 parts per million different from unity depending on the temperature and water vapor content of the air. This is precisely the reason that most line-of-sight computations of terrestrial paths increase the effective radius of the earth by about 1.33. Under some tropospheric conditions like when the temperature increases with height and/or when anomalous water vapor content is present, ducting can occur and VHF/UHF paths may extend to thousands of kilometers. This is especially true of over-water paths like the frequent duct that occurs between southern California and Hawaii or between Italy and Spain. Since the path in question is over water, this is probably the reason signals are received from the satellite when it is below the apparent horizon.

The second effect that is occurring is a reflection of the signals from the water, so the antenna is receiving two different signals. In optics this is often called the "Lloyd's mirror" effect. When the signal is reflected, its phase is changed by 180 degrees, so the direct and reflected signals arrive at the antenna out of phase and cancel at the horizon. At other elevations, the two signals traverse different paths so the phase difference of the direct and reflected signals varies, and the signals may either add constructively (increasing the signal strength) or destructively (causing a null). If the angles at which maxima and minima signal were known, it would be possible to compute the height of receiving antenna above the level of the sea (reflector).

This reflection effect was first seen in about 1947 when some Australians observed the radio "star" Cygnus-A from an antenna atop a sea cliff. The fact that they observed deep nulls allowed them to demonstrate that Cygnus-A was a compact object, smaller than a few arc-minutes in diameter and not a large-scale feature of the previously discovered radiation from our Milky Way galaxy. This work was done at VHF frequencies not far from our 2M amateur band.

[The AMSAT News Service (ANS) would like to thank Tom Clark (W3IWI) for

this explanation and IT9XXS for posing the question.]

/EX
SB SAT @ AMSAT $ANS-071.02
STS-59 SAREX INFO

HR AMSAT NEWS SERVICE BULLETIN 071.02 FROM AMSAT HQ
SILVER SPRING, MD MARCH 12, 1994
TO ALL RADIO AMATEURS BT
BID: $ANS-071.02

N5QWL Provides A "Fact" Sheet For The Upcoming STS-59 SAREX Mission

Shuttle Amateur Radio Experiment (SAREX) Fact Sheet

STS-59 Space Shuttle Endeavour

When: Planned Launch April 7, 1994 at 12:07 UTC for 9 days of 2M operations.

Where: Earth Orbit. Altitude 220 kilometers, with radio coverage of latitudes from 70 degrees North to 70 degrees South. We are in one of the lowest altitude orbits ever flown by the shuttle, so pass times will be shorter than usual.

Operators: Dr. Jay Apt (N5QWL) and Dr. Linda Godwin N5RAX. N5QWL is the commander of the Blue Shift aboard Endeavour and will operate the shuttle systems during the "night" shift, while N5RAX is the Payload Commander, responsible for overall operation of three large radars in the shuttle's cargo bay during the "day" shift.

Modes: FM Voice
VOICE CALL SIGNS: N5QWL and N5RAX
Packet (Beacons giving daily mission activities daily if we get a chance, and robot QSOs -- successful connects will be issued a contact number by the robot) PACKET CALL SIGN: W5RRR-1

Frequencies: We will operate split.
PLEASE DO NOT TRANSMIT ON THE DOWNLINK FREQUENCY!

VOICE: Downlink (shuttle transmits) on 145.55 MHz
Uplink (ground transmits) on 144.91, 144.93, 144.95, 144.97, and 144.99 (except over Europe) - we'll listen on those 5 frequencies to spread out the pileup a bit.
Uplink for Europe only: 144.80, 144.75, 144.70

Successful QSOs on voice will be facilitated by using standard international phonetics for your call sign. We will not answer any stations using non-standard phonetics. Use your entire call sign -- we log with an audio tape recorder. Do not use our call sign -- passes are very short, and we want to work as many folks as possible.

PACKET: Downlink (shuttle transmits) on 145.55
Uplink (ground transmits) on 144.49 (worldwide)

If you can, decrease your radio's deviation to 3 KHz (most are initially set at 5 KHz) and compensate for the Doppler shift. If you cannot, wait until a minute or 90 seconds after we come over your horizon to transmit -- that will put you within our IF. If a station transmits without following these suggestions, we just hear what sounds like a noisy carrier. The above applies to both voice

and packet.

QSL via: ARRL, ATTN: STS-59 QSLs, 225 Main Street, Newington, CT 06111, USA. Include a self-addressed stamped envelope (SASE). Non-US stations include a self addressed envelope with $0.50 of US postage affixed or appropriate IRCs. Include the Callsign worked, Date, UTC, Mode, and Frequency. For packet contacts, include the QSO number issued by the robot. SWL QSL's: Include the Callsign heard, Date, UTC, Mode, and Frequency.

Information during the mission: AMSAT bulletins, Compuserve, Genie, Prodigy, local packet bulletin boards, ARRL bulletins, and HF voice from NASA Johnson Space Center ARC, Houston, Texas, W5RRR, or NASA Goddard Spaceflight Center ARC, Greenbelt, Maryland, WA3NAN, frequencies listed below.

W5RRR may be found on or near: 7.215, 14.280, 21.360, and 28.400 MHz.

WA3NAN retransmits NASA Select Audio and SAREX bulletins simultaneously on or near 3.860, 7.185, 14.295, 21.395, and 28.650 MHz.

The NASA Info BBS at Johnson Space Center, Houston, will also carry Keplerian elements and SAREX bulletins. (713) 483-2500, 1200 baud, 8-N-1. At the "ENTER NUMBER:" prompt, type 62511 <return> and log onto the BBS. The Keps and bulletins will be in the welcome message. Disconnect rapidly to facilitate access by others.

Operations Notes: If you have a packet QSO number issued to you by the robot, don't try to get another one! Our on-board program drops the duplicates anyhow, and all you are doing is making it harder for the other folks. We'll issue you a QSL card if you appear in the "heard" list on the TNC and we have issued you a QSO number...that's a 2-way contact, AND REMEMBER, THIS IS ONLY A HOBBY!

N5QWL will be asleep over most USA passes, and N5RAX will be busy with assigned duties for most daylit US passes, so try us on packet over the USA if the sun is up. Remember, our packet call sign is W5RRR-1. We'll try to work voice (1) when we are not otherwise engaged, and (2) at night or when the ground is cloudy (we are generally busy taking pictures of the Earth during clear daylight passes).

If I can get to it, I'll activate the SAREX about 3 hours into the mission; deactivation will occur at about 8 days, 17 hours after launch (unless we get a one-day science mission extension, then it will be deactivated at about 9 days, 17 hours after launch).

Prelaunch Keplerian Elements, courtesy of Gil Carman (WA5NOM) of the JSC ARC):

STS-59
1 00059U 94097.74947238 .00221188 00000-0 11303-3 0 70
2 00059 57.0053 276.3038 0009259 269.9963 90.0094 16.19806752 56

Satellite: STS-59
Catalog number: 00059
Epoch time: 94097.74947238 = (07-APR-94 17:59:14.41 UTC)
Element set: 007
Inclination: 57.0053 deg
RA of node: 276.3038 deg Space Shuttle Flight STS-59
Eccentricity: .0009259 Prelaunch Element set JSC-007
Arg of perigee: 269.9963 deg Launch: 07-APR-94 12:07 UTC

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Mean anomaly:      90.0094 deg
Mean motion:   16.19806752 rev/day             G. L. Carman
Decay rate:    2.21188e-03 rev/day^2      NASA Johnson Space Center
Epoch rev:               5
Checksum:              327
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[The AMSAT News Service (ANS) would like to thank N5QWL for in this bulletin item.]

/EX
SB SAT @ AMSAT $ANS-071.03
AO-13 OPERATIONS NET SCHEDS

HR AMSAT NEWS SERVICE BULLETIN 071.03 FROM AMSAT HQ
SILVER SPRING, MD MARCH 12, 1994
TO ALL RADIO AMATEURS BT
BID: $ANS-071.03

Current AMSAT Operations Net Schedule For AO-13

AMSAT Operations Nets are planned for the following times. Mode-B Nets are conducted on AO-13 on a downlink frequency of 145.950 MHz. If, at the start of the OPS Net, the frequency of 145.950 MHz is being used for a QSO, OPS Net enthusiasts are asked to move to the alternate frequency of 145.955 MHz.

Date	UTC	Mode	Phs	NCS	Alt NCS
19-Mar-94	1730	B	073	W5IU	WA5ZIB
26-Mar-94	2130	B	084	WA5ZIB	W5IU

Any stations with information on current events would be most welcomed. Also, those interested in discussing technical issues or who have questions about any particular aspect of OSCAR statellite operations, are encouraged to join the OPS Nets. If neither of the Net Control Stations show up, any participant is invited to act as the NCS.

AO-13 ZRO Tests For March 1994

The following schedule of Mode "B" tests were chosen for convenient operating times and favorable squint angles. The tests can be heard on 145.840 MHz. Andy McAlister (WA5ZIB) will conduct all the tests. Mode "JL" tests will no longer occur due to the failure of AO-13's 70CM transmitter.

Day	Date (UTC)	Time	Areas covered
Saturday	Mar. 19, 1994	1930 UTC	NA, SA, Europe, Africa
Saturday	Mar. 26, 1994	2315 UTC	NA, SA

Note that the dates and days are shown in "UTC". Any changes will be announced as soon as possible via the AMSAT HF and AO-13 Operations Nets.

All listener reports with date of test and numbers copied should be sent to Andy MacAllister (WA5ZIB), AMSAT V.P. User Operations, 14714 Knights Way Drive, Houston, TX 77083-5640. A report will be returned verifying the level of accurate reception. An S.A.S.E. is appreciated but not required.

/EX
SB SAT @ AMSAT $ANS-071.04
WEEKLY OSCAR STATUS REPORTS

HR AMSAT NEWS SERVICE BULLETIN 071.04 FROM AMSAT HQ

SILVER SPRING, MD MARCH 12, 1994
TO ALL RADIO AMATEURS BT
BID: $ANS-071.04

Weekly OSCAR Status Reports: 12-MAR-94

AO-13: Current Transponder Operating Schedule:
L QST *** AO-13 TRANSPONDER SCHEDULE *** 1994 Jan 31-Apr 04
Mode-B : MA 0 to MA 90 |
Mode-BS : MA 90 to MA 120 |
Mode-S : MA 120 to MA 145 |<- S transponder; B trsp. is OFF
Mode-S : MA 145 to MA 150 |<- S beacon only
Mode-BS : MA 150 to MA 180 | Blon/Blat 180/0
Mode-B : MA 180 to MA 256 |
Omnis : MA 230 to MA 30 | Move to attitude 240/0, Apr 04
[G3RUH/DB2OS/VK5AGR]

FO-20: The following is the current schedule for transponder operations:
ANALOG MODE:

23-MAR-94 7:52 -TO- 30-MAR-94 8:15 UTC

DIGITAL MODE: Unless otherwise noted above.
[Kazu Sakamoto (JJ1WTK) qga02014@niftyserve.or.jp]

RS-10: Still operating normally for ZS6AOP. The usual regular stations are often found working thru the satellite as well as the "odd" new comer. Reports of copying the beacon while well below the horizon, over the South Pole on south-to-north passes with good signal strengths have been coming in. Hopefully, with more stations becoming active there will be some real long distance sub-horizon contacts soon. [ZS6AOP]

RS-12: RS-12 is currently operating in Mode K. The uplink passband is 21.210 - 21.250 MHz with downlink on 29.410 - 29.450 MHz. The transponder is non-inverting USB or CW, i.e., if you are on 21.225, then listen on 29.425 +/- the doppler shift, adjust your transmit frequency as you work the satellite to keep the downlink frequency constant. The beacon frequencies are 29.408 MHz or 29.454 MHz. The Robot operates on 29.454 MHz. The uplink frequency for the the Robot is 21.129 MHz. When the Robot is not operating, this freq-uency pair can also be used for general QSOs.
[KB8FGC @ KC8TW.#swoh.usa.na]

AO-21: This OSCAR sends down beautiful signals, 59+ signals about 90% of the time. Along with DOVE, ZS6AOP can recommend AO-21 to anyone who wants to start capturing and examing telemetry using basic equipment. [ZS6AOP]

AO-16: Operating normally. [WH6I]

LO-19: Operating normally. [WH6I]

IO-26: Operating normally. [WH6I]

KO-23: Operating normally. [WH6I]

KO-25: Operating normally. KO-25 has a number of new earth images this past week. So far WH6I notes that he has not seen any pictures that were particularly interesting to him. [WH6I]

AO-27: There is no particular schedule transponder schedule per se, and the way it works is that amateur radio section of the satellite has only solar cell illumination to power it so as to not strain the drain of

on board battery power on the commercial side. Therefore, if your using ITRACK OR QUICKTRACK watch the sun terminator (sun darkness line) when it crosses into the light, the Analog repeater turns on but not until it is in sunlight. N4OUL's own experience is that he has worked it with a hand held ICOM-2AT on low power 2.5 W into 4 el 2M antenna and was full quieting stateside. Also VE3BDR worked it with a portable low power with a mag mount. Uplink on 2M is FM at 145.850 MHz and downlink on FM at 436.800 MHz. [N4OUL]

The AMSAT NEWS Service (ANS) is looking for volunteers to contribute weekly OSCAR status reports. If you have a favorite OSCAR which you work on a regular basis and would like to contribute to this bulletin, please send your observations to WD0HHU at his CompuServe address of 70524,2272, on INTERNET at wd0hhu@amsat.org, or to his local packet BBS in the Denver, CO area, WD0HHU @ W0LJF.#NECO.CO.USA.NOAM. Also, if you find that the current set of orbital elements are not generating the correct AOS/LOS times at your QTH, PLEASE INCLUDE THAT INFORMATION AS WELL. The information you provide will be of value to all OSCAR enthusiasts.

/EX